1. A thermoacoustic generator comprising:

a housing containing a working volume of gas with a pressure;

a thermoacoustic core supported in the housing and having a first heat exchanger and a second heat exchanger, the thermoacoustic core operable to introduce acoustical power into the housing thereby oscillating the pressure of the gas at a frequency; and

a piezoelectric alternator supported in the housing and having a face that is movable when acted on by acoustical power, the alternator further including a portion of piezoelectric material operable to produce electrical power when acted on by a stress, the portion of piezoelectric material being in mechanical communication with the movable face such that movement of the face stresses the portion of piezoelectric material so as to produce electrical power;

wherein the alternator has a moving mass that serves as a substantial portion of the resonating mass inside the housing, thereby providing a pressure oscillation frequency in the housing substantially lower than for a similar system with a rigid member replacing the alternator.

2. The thermoacoustic generator according to claim 1, wherein the movable face of the alternator substantially blocks the passage of the gas.

3. The thermoacoustic generator according to claim 2, wherein the housing has a side wall, the movable face comprising a first diaphragm with a perimeter seal substantially sealing the first diaphragm to the side wall of the housing.

4. The thermoacoustic generator according to claim 3, wherein the perimeter seal is selected from the group consisting of a roll sock, a bellows, and a clearance seal.

5. The thermoacoustic generator according to claim 3, further comprising a second diaphragm forming a second face of the alternator, the portion of piezoelectric

material also being in mechanical communication with the second face and being disposed between the first and second diaphragms.

6. The thermoacoustic generator according to claim 1, wherein the piezoelectric alternator further comprises:

a perimeter member including the portion of piezoelectric material, the perimeter member configured such that compression of the perimeter member causes compression of the portion of piezoelectric material, the perimeter member surrounding a central area;

a hub disposed in the central area, the hub being movable relative to the perimeter member along an axis, the hub being in mechanical communication with the movable face of the alternator; and

a plurality of spokes interconnecting the hub and the perimeter member such that relative movement of the hub along the axis compresses the perimeter member and thereby compresses the piezoelectric material.

7. The thermoacoustic generator according to claim 6, wherein the housing has a side wall, the alternator face comprising a first diaphragm having a perimeter seal sealing the first diaphragm to the side wall of the housing, the perimeter seal being selected from the group consisting of a roll sock, a bellows, and a clearance seal.

8. The thermoacoustic generator according to claim 7, further comprising a second diaphragm in mechanical communication with the hub, the second diaphragm having a perimeter seal sealing the diaphragm to the side wall of the housing, the perimeter member, hub, and spokes being disposed between the first and second diaphragms.

9. The thermoacoustic generator according to claim 6, wherein the perimeter member is generally ring-shaped.

10. The thermoacoustic generator according to claim 9, wherein the piezoelectric material portion of the ring-shaped perimeter member is substantially all of the ring-shaped perimeter member.

11. The thermoacoustic generator according to claim 6, wherein the perimeter member is generally polygonal shaped with intersection zones defined between adjacent generally straight segments, the portion of piezoelectric material comprising a portion of each of the straight segments.

12. The thermoacoustic generator according to claim 11, wherein the spokes are interconnected with the intersection zones of the polygonal-shaped perimeter member.

13. The thermoacoustic generator according to claim 11, wherein the generally straight segments of the perimeter member each further comprise a spring in series with the portion of piezoelectric material.

14. The thermoacoustic generator according to claim 1, wherein the piezoelectric alternator further comprises:

a perimeter support member generally defining an alternator plane, the member surrounding a central area;

a hub disposed in the central area, the hub being movable relative to the perimeter support member along an axis generally perpendicular to the plane, the hub being in mechanical communication with the movable alternator face; and

the portion of piezoelectric material comprising a plurality of piezoelectric bimorph members each having an inner end in mechanical communication with the hub and an outer end supported by the perimeter support member such that relative movement of the hub along the axis flexes the bimorph members.

15. The thermoacoustic generator according to claim 14, wherein the bimorph members are generally wedge shaped such that a width of the members parallel to the alternator plane is narrower at the inner ends than at the outer ends.

16. The thermoacoustic generator according to claim 14, wherein the perimeter support member is generally circular.

17. The thermoacoustic generator according to claim 14, wherein the housing has a side wall, the alternator face comprising a first diaphragm having a perimeter seal sealing the first diaphragm to the side wall of the housing, the perimeter seal being selected from the group consisting of a roll sock, a bellows, and a clearance seal.

18. The thermoacoustic generator according to claim 17, further comprising a second diaphragm in mechanical communication with the hub, the second diaphragm having a perimeter seal sealing the diaphragm to the side wall of the housing, the perimeter support member, hub, and bimorph members being disposed between the first and second diaphragms.

19. The thermoacoustic generator according to claim 1, wherein the piezoelectric alternator further comprises at least one spring in series with the portion of piezoelectric material so as to alter the stiffness of the piezoelectric alternator.

20. The thermoacoustic generator according to claim 1, wherein the piezoelectric alternator further comprises a perimeter wall having a plurality of wall segments interconnected by springs, the portion of piezoelectric material comprising at least a portion of one of the wall segments, the movable face of the alternator comprising a surface of the wall segment.

21. The thermoacoustic generator according to claim 20, wherein the piezoelectric alternator further comprises an alternator body enclosing a portion of the working volume of gas, the perimeter wall forming part of the alternator body.

22. The thermoacoustic generator according to claim 20, wherein the perimeter wall substantially separates the housing into first and second coaxial regions, the thermoacoustic core supported in one of the regions.

23. The thermoacoustic generator according to claim 22, further comprising a second thermoacoustic core supported in the other of the regions, the thermoacoustic cores being coaxially arranged.

24. The thermoacoustic generator according to claim 20, wherein the portion of piezoelectric material comprises substantially the entirety of all of the wall segments.

25. A piezoelectric transducer for converting between acoustical power, consisting of pressure and velocity, and electrical power, consisting of potential and current, the transducer comprising:

a perimeter member including at least one portion of piezoelectric material, the perimeter member configured such that compression of the perimeter member causes compression of the portion of piezoelectric material, the perimeter member surrounding a central area;

a hub disposed in the central area, the hub being movable relative to the perimeter member along an axis; and

a plurality of spokes interconnecting the hub and the perimeter member such that relative movement of the hub along the axis compresses the perimeter member and thereby compresses the piezoelectric material.

26. The piezoelectric transducer according to claim 25,wherein the transducer is a driver that converts electrical power to acoustical power, the transducer further comprising:

a first diaphragm in mechanical communication with the hub such that movement of the hub moves at least a portion of the diaphragm;

wherein electrical power is applied to the piezoelectric material causing movement of at least a portion of the perimeter member, thereby causing movement of the spokes, thereby causing movement of the hub, thereby causing movement of at least a portion of the diaphragm, thereby creating acoustical power.

27. The piezoelectric transducer according to claim 26, further comprising a second diaphragm in mechanical communication with the hub such that movement of the hub moves at least a portion of the second diaphragm, the hub and spokes being disposed between the first and second diaphragm.

28. The piezoelectric transducer according to claim 25,wherein the transducer is an alternator that converts acoustical power to electrical power, the transducer further comprising:

a first diaphragm in mechanical communication with the hub such that movement of the hub moves at least a portion of the diaphragm;

wherein acoustical power is applied to the first diaphragm, thereby causing movement of the face and hub, thereby compressing the piezoelectric material.

29. The piezoelectric transducer according to claim 26, further comprising a second diaphragm in mechanical communication with the hub such that movement of the hub moves at least a portion of the second diaphragm, the hub and spokes being disposed between the first and second diaphragms.

30. The piezoelectric transducer according to claim 25, wherein the perimeter member is generally ring-shaped.

31. The piezoelectric transducer according to claim 30, wherein the piezoelectric material portion of the ring-shaped perimeter member comprises substantially the entire ring-shaped perimeter member.

32. The piezoelectric transducer according to claim 25,wherein the perimeter member is generally polygonal shaped with intersection zones defined between adjacent generally straight segments, the at least one piezoelectric material portion of the perimeter member comprising a portion each of the straight segments.

33. The piezoelectric transducer according to claim 32, wherein the spokes are interconnected with the intersection zones of the polygonal-shaped perimeter member.

34. The piezoelectric transducer according to claim 32, wherein the generally straight segments of the perimeter member each further comprise a spring in series with the portion of piezoelectric material.

35. A piezoelectric transducer for converting between acoustical power, consisting of pressure and velocity, and electrical power, consisting of potential and current, the transducer comprising:

a perimeter support member generally defining a transducer plane, the member surrounding a central area;

a hub disposed in the central area, the hub being movable relative to the perimeter support member along an axis generally perpendicular to the plane; and

a plurality of piezoelectric bimorph members each having an inner end in mechanical communication with the hub and an outer end supported by the perimeter

support member such that relative movement of the hub along the axis flexes the bimorph members.

36. The piezoelectric transducer according to claim 35, wherein the transducer is an alternator operable to convert acoustical power to electrical power, the alternator further comprising

a first diaphragm in mechanical communication with the hub such that movement of the face causes movement of the hub along the axis;

whereby acoustical power acts to move the first diaphragm and hub, thereby flexing the bimorphs and creating electrical power.

37. The piezoelectric transducer according to claim 35, wherein the bimorph members are generally wedge shaped such that width of the members parallel to the transducer plane is narrower at the inner ends than at the outer ends.

38. A piezoelectric transducer for converting between acoustical power, consisting of pressure and velocity, and electrical power, consisting of potential and current, the transducer comprising:

a transducer assembly including at least one piezoelectric element configured to produce electrical power when acted on by a mechanical force; and

at least one spring in series with the piezoelectric element so as to alter the resonant frequency of the transducer assembly.

39. A thermoacoustic device comprising:

a housing containing a working volume of gas with a pressure;

a piezoelectric transducer separating the housing into a first area containing a first volume of gas and a second area containing a second volume of gas, the transducer comprising a perimeter wall having at least one portion of piezoelectric material and at least one spring in series;

a first thermoacoustic core supported in the first area of the housing and including a pair of heat exchangers; and

a second thermoacoustic core supported in the second area of the housing and including a pair of heat exchangers.